

WHAT IS CLAIMED IS:

- 1                   1.       An automated detection algorithm to compute the ring profile of colon  
2 like surfaces comprising the steps of:  
3                   providing an original image of a colon like surface disposed along a major  
4 axis in a scan having vertex points, each vertex point having a discrete point identifier and  
5 three dimensional position information;  
6                   generating a thin version of the colon like surface utilizing neighbors  
7 averaging of the three dimensional position information for every vertex point in the original  
8 colon view;  
9                   modeling the thin version of the colon like surface with an ordered set of 3-D  
10 points to produce a curve proximate to the major axis of the colon like surface;  
11                   isolating segments of vertex points (along) between planes normal to the curve  
12 proximate to the major axis of the colon from the thin version of the colon like surface;  
13                   mapping the isolated segments of vertex points from the thin version of the  
14 colon like surface back to the original image of the colon like surface to generate a ring  
15 profile of the colon like surface.
- 1                   2.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 1 comprising the steps of:  
3                   decimating the vertex points of the provided original image.
- 1                   3.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 1 comprising the steps of:  
3                   computing a centerline of the colon utilizing the ring profile of the colon like  
4 surface.
- 1                   4.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 3 comprising the steps of:  
3                   measuring along the computed centerline of the colon like surface to  
4 determine positional information relative to the colon like surface.
- 1                   5.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 3 comprising the steps of:  
3                   computing a smoothed version of the centerline of the colon to approximate  
4 centerlines obtained by invasive colonoscopy.

1                   6.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 3 comprising the steps of:

3                   utilizing the ring profile along a preselected length of the computed colon  
4 centerline to determine the local colon volume and local colon distension along the  
5 preselected length of the colon.

1                   7.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 3 comprising the steps of:

3                   mapping the vertices distance to the computed centerline; and,  
4 building an image of vertices distances to centerline to map the colon.

1                   8.       The automated detection algorithm to compute the ring profile of colon  
2 like surfaces according to claim 3 comprising the steps of:

3                   mapping the vertices distance to the computed centerline to obtain a mapped  
4 centerline view of the colon;

5                   rotating the mapped centerline view of the colon to spatially reorient the  
6 mapped centerline view of the colon; and,

7                   reconstructing a spatially reoriented image of the colon from the rotated  
8 centerline view by expanding the vertices distances to map the colon.

1                   9.       An automated detection algorithm to compute the ring profile of colon  
2 like surfaces comprising the steps of:

3                   providing an original image of the colon like surfaces disposed along a major  
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point  
5 having a discrete point identifier and three-dimensional positional information;

6                   generating a thinned image of the colon like surface utilizing a neighbors  
7 averaging of the three-dimensional positional information for vertex points in the original  
8 colon view;

9                   randomly designating a first vertex modeling point at a vertex point along the  
10 thinned the colon image;

11                  identifying and marking neighboring vertex points to the randomly selected  
12 first vertex modeling point;

13                  designating a second vertex modeling point located at a predetermined  
14 distance from the first of vertex modeling point;

15 sequentially repeating the identifying and marking, and designating steps to  
16 designate vertex modeling points from the randomly selected first vertex modeling point to  
17 an end of the colon;  
18 connecting the designated vertex modeling points to produce a curve  
19 proximate to the major axis of the colon like surface;  
20 isolating groups of vertex points between planes normal to the curve from the  
21 thin image of the colon like surface; and,  
22 mapping the isolated groups of a vertex points from the thinned image of the  
23 colon like surface back to the original image of the colon like surface to generate a ring  
24 profile of the colon like surface.

1 10. An automated detection algorithm to compute an approximate  
2 centerline profile of colon like surfaces comprising the steps of:  
3 providing an original image of the colon like surfaces disposed along a major  
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point  
5 having a discrete point identifier and three-dimensional positional information;  
6 generating a thinned image of the colon like surface utilizing a neighbors  
7 averaging of the three-dimensional positional information for vertex points in the original  
8 colon view;  
9 randomly designating a first vertex modeling point at a vertex point along the  
10 thinned the colon image;  
11 identifying and marking neighboring vertex points to the randomly selected  
12 first vertex modeling point;  
13 designating a second vertex modeling point located at a predetermined  
14 distance from the first of vertex modeling point;  
15 sequentially repeating the identifying and marking, and designating steps to  
16 designate vertex modeling points from the randomly selected first vertex modeling point to  
17 an end of the colon;  
18 connecting the designated vertex modeling points to produce a curve  
19 proximate to the major axis of the colon like surface.

1 11. An automated detection algorithm to compute the ring profile of colon  
2 like surfaces comprising the steps of:

3 providing an original image of the colon like surfaces disposed along a major  
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point  
5 having a discrete point identifier and three-dimensional positional information;

6 generating a thinned image of the colon like surface utilizing a neighbors  
7 averaging of the three-dimensional positional information for vertex points in the original  
8 colon view;

9 randomly designating a first vertex modeling point at a vertex point along the  
10 thinned the colon image;

11 identifying and marking neighboring vertex points to the randomly selected  
12 first vertex modeling point;

13 designating a second vertex modeling point located at a predetermined  
14 distance from the first of vertex modeling point;

15 sequentially repeating the identifying and marking, and designating steps to  
16 designate vertex modeling points from the randomly selected first vertex modeling point to  
17 an end of the colon;

18 connecting the designated vertex modeling points to produce a curve  
19 proximate to the major axis of the colon like surface;

20 isolating groups of vertex points between planes normal to the curve from the  
21 thin image of the colon like surface; and,

22 mapping the isolated groups of a vertex points from the thinned image of the  
23 colon like surface back to the original image of the colon like surface to generate a ring  
24 profile of the colon like surface.

1 12. An automated detection algorithm to compute an approximate  
2 centerline profile of colon like surfaces comprising the steps of:

3 providing an original image of the colon like surfaces disposed along a major  
4 axis in a scan having the colon like surface identified by vertex points, each of vertex point  
5 having a discrete point identifier and three-dimensional positional information;

6 generating a thinned image of the colon like surface utilizing a neighbors  
7 averaging of the three-dimensional positional information for vertex points in the original  
8 colon view;

9 randomly designating a first vertex modeling point at a vertex point along the  
10 thinned the colon image;

11 identifying and marking neighboring vertex points to the randomly selected  
12 first vertex modeling point;  
13 designating a second vertex modeling point located at a predetermined  
14 distance from the first of vertex modeling point;  
15 sequentially repeating the identifying and marking, and designating steps to  
16 designate vertex modeling points from the randomly selected first vertex modeling point to  
17 an end of the colon;  
18 connecting the designated vertex modeling points to produce a curve  
19 proximate to the major axis of the colon like surface.